TRANSLATION OF JP-08065956 A

PAT-NO: JP408065956A

DOCUMENT-IDENTIFIER: **JP 08065956 A**

TITLE: BALANCE CORRECTING METHOD FOR MOTOR DRIVEN BLOWER AND
BALANCE MEASURING APPARATUS FOR ROTOR

PUBN-DATE: March 8, 1996

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APPL-NO: JP07046794

APPL-DATE: March 7, 1995

INT-CL (IPC): H02K007/14, F04D029/62 , H02K007/04 , H02K015/16

ABSTRACT:

PURPOSE: To provide a method for correcting the balance of a motor driven blower which can conduct the combination balance correction after the blower is assembled and a balance measuring apparatus for a rotor.

CONSTITUTION: An unbalance position detecting groove 21 is provided on the end face of a rotary shaft fixedly mounted with a rotor 4 and a centrifugal impeller, and the unbalance position of the rotor 4 and the impeller is detected by acceleration pick-up sensors 28, 29 mounted on the outer periphery of the blower 1 by using an optical sensor 22. Thus, the unbalance of the impeller is so corrected that the phases of the unbalance position of the rotor 4 and the unbalance position of the impeller become substantially the same phase. Thus, the combination balance correction after the blower is assembled is facilitated. Even at the high speed rotation, low vibration and low noise

operation is performed, the balance accuracy of a commutator can be improved, stable commutation is obtained, and the reliability of a commutator motor can be improved.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the combination balance correction approach and the balance measuring device of body of revolution, in order to maintain the engine performance which was applied to the balance correction approach of the electric blower constituted with a commutator motor and an impeller, and the balance measuring device of body of revolution, especially was stabilized.

[0002]

[Description of the Prior Art] Before incorporating the air guide which served as the end bracket and which has a bearing attaching part as indicated by JP,60-122300,A as the combination balance correction approach of a motor, a rotator is made to fix a radial impeller conventionally, and the structure of making balance correction in the condition of having made these unifying is introduced. Moreover, the whole motor is installed in a balance adjusting device, the Rota section is rotated, and the equipment which sticks the member for balance adjustment on the Rota section, and performs rotation balance adjustment is introduced as indicated by JP,2-231947,A.

[0003]

[Problem(s) to be Solved by the Invention] In JP,60-122300,A of said conventional

example, although balance correction is to make a rotator and a radial impeller unify and to be made, the axial center precision of bearing when combination balance is incorporated as a motor while the amount of imbalance of the above-mentioned revolving-shaft section itself influenced greatly also influences. Therefore, although balance correction of the rotation section itself is possible, balance correction in the last motor assembly condition, i.e., the condition that bearing was held, is impossible, and has a possibility that the balance precision after assembly may fall. Moreover, there was no publication about detection of the imbalance location in the case of actually making combination balance correction or positioning of an imbalance correction part, the fixed approach, etc., and it had become a big problem by the time it realized.

[0004] Moreover, in JP,2-231947,A, the composed whole motor was installed in the balance adjusting device, and since it was the configuration of detecting the imbalance section of a motor through a balance adjusting device, problems, like dispersion arises depending on the method of installation of a motor were in detection precision.

[0005] It is for providing about the balance correction approach of an electric blower of carrying out combination balance correction required in order the purpose of this invention realizes the concrete balance correction approach at the time of making combination balance correction, raises combination balance precision as high-speed rotation correspondence, and aims at vibration and reduction of the noise, and stabilizes sliding of a carbon brush and to prevent the increment of performance degradation or a

carbon brush in wear, and the balance measuring device of body of revolution.

[0006]

[Means for Solving the Problem] In the balance correction approach of an electric blower of this invention detecting the imbalance location of the rotator attached and fixed to the revolving shaft of the commutator motor which it had in the electric blower, and an impeller, and making balance correction in order to attain the above-mentioned purpose It is characterized by making imbalance correction of said impeller so that said rotator and said impeller may be combined, the imbalance location of said rotator and an impeller may be detected respectively and the phase of the imbalance location of said rotator and the imbalance location of said impeller may turn into an inphase mostly.

[0007]

[Function] According to this invention, the imbalance location of a rotator and an impeller attached and fixed to the revolving shaft of a commutator motor is detected where a rotator and an impeller are built into an electric blower, and it measures the phase (gap as angle of rotation) of each other imbalance location. It considers that the phase of the measured imbalance location is an imbalance correction include angle, and an impeller is rotated to the revolving shaft of a commutator motor so that it may become an inphase (gap of angle of rotation is lost) mostly about this imbalance correction include angle. Since an impeller can be rotated to a revolving shaft by this where a rotator and an impeller are built into an electric blower, imbalance correction can be made easily.

[0008] Moreover, the imbalance location of a rotator and the imbalance location of an impeller can detect respectively by installing an acceleration-pickup sensor in the periphery section of a motor, the square wave which serves as criteria from the slot for imbalance location detection which used optical sensors, such as reflective mold diode, and was established in the revolving-shaft end face of a rotator makes, and measurement of an imbalance location can process and measure the oscillating sound from the above-mentioned acceleration-pickup sensor on the basis of this square wave.

[0009]

[Example] Hereafter, the balance correction approach of the electric blower concerning one example of this invention is explained using a drawing.

[0010] First, drawing 1 shows the example applied to the electric blower used for a vacuum cleaner. An electric blower 1 consists of the motor section 2 and the blower section 3.

[0011] The motor section 2 is a commutator form motor, and a rotator 4 and a stator 5 are contained in housing 6 and an end bracket 7. The rotator 4 was supported by bearing 13 and 14, and the revolving shaft 15 penetrated the end bracket 7, and is prolonged to the blower section 3 side.

[0012] A fixed guide vane 8 arranges the blower section 3 on an end bracket 7, and an impeller (a radial impeller is called hereafter) 9 is really fixed by the revolving shaft 15 with a screw 16 on it. Furthermore, they are covered, press fit immobilization is carried

out with end bracket 7 periphery, and casing 10 is carrying out **** immobilization of the fixed guide vane 8.

[0013] Arrangement immobilization of a balancing ring 17, a commutator 18, and the iron core 19 is carried out between the both-ends bearing 13 and 14, a coil 20 is wound around an iron core 19, and a rotator 4 is electrically connected to the periphery section of a commutator 18 in it. A balancing ring 17 is for balancing rotator 4 self.

[0014] Moreover, within a brush holder 11, the carbon brush 12 contained by the brush holder 11 by which screw stop immobilization is carried out on the peripheral face of housing 6 was energized by the spring etc., contacted the peripheral face of a commutator 18, and is connected electrically. a rotator 4 and a radial impeller 9 are manageable to below a predetermined value for every each with a balance corrector etc., although imbalance occurs from the dimension variation on manufacture etc. to each. Drawing 2 (a) and (b) show the measurement result after balance correction of a radial impeller 9 and balance revision of a rotator 4.

[0015] However, at the time of assembly ****, as shown at (c), rather than the value managed at above each, the amount of combination imbalance becomes large and a large thing causes oscillating noise and a dependability fall from the difference in the vector sum of the fitting clearance between a revolving shaft 15 and the bore of a radial impeller 9, and the imbalance at the time of being put together at an electric blower 1. Therefore, an electric blower 1 needs to make combination balance correction after assembly ****.

If an electric blower 1 energizes in the motor section 2 after assembly **** like drawing 1 , a radial impeller 9 will rotate with a rotator 4. Although the above-mentioned combination imbalance is measured and corrected at this time, a concrete measuring method is described below.

[0016] first, a location detection wave as shown in drawing 3 , when the slot 21 for imbalance location detection is established in the end face of a revolving shaft 15 and a revolving shaft 15 rotates by the reflected light from the optical sensor (for example, photodiode) 22, as shown in drawing 5 -- 23 and 24 are obtained. A revolving shaft 15 rotates, if the slot 21 for imbalance location detection passes the reflected light section of a photodiode 22, it will detect the output wave of a photodiode 22 high-level like 23 shown in drawing 5 , and the output wave after passing through the slot 21 for imbalance location detection detects a low level like 24.

[0017] Moreover, the sinusoidal form 25 of drawing 5 senses vibration of the rotator 4 which gets across to housing 6 by the acceleration-pickup sensor 28 which adsorbed with the magnet 27 on the peripheral face of housing 6 in drawing 4 , and shows the wave of the primary rotation component detected through the filter. Similarly, it is the wave of the primary rotation component which the sinusoidal form 26 has sensed vibration of the radial impeller 9 which gets across to casing 10 by the acceleration-pickup sensor 29 which adsorbed on the peripheral face of casing 10, and was detected through the filter, and the maximum points A and B of the amplitude are the imbalance correction locations

of a rotator 4 and a radial impeller 9, respectively.

[0018] the imbalance correction location detected by the above, respectively -- a location detection wave -- it can calculate in quest of the periods Ta and Tb from 23, and can ask for an imbalance correction include angle. It is more possible than the called-for imbalance correction include angle to rotate a radial impeller 9 to a revolving shaft 15, and to reduce the deflection of a commutator 18 so that it may become an inphase in the imbalance correction location of a rotator 4 mostly about the imbalance correction location of a radial impeller 9. Moreover, instead of rotating a radial impeller 9, the imbalance location of a radial impeller 9 may be cut by the drill, a cutter, etc., or balance correction may be made by the correction approaches, such as a load addition method.

[0019] Next, by making mostly the imbalance correction location of a rotator 4 and a radial impeller 9 into an inphase explains how the deflection of the commutator 18 currently fixed to the rotator 4 can decrease. The displacement mode of a rotator 4 turns into the displacement mode 30 as is shown by the dotted line by the direction A of the imbalance which remains to the iron core 19, as shown in drawing 6 . Then, when there is residual imbalance in the direction of B of a radial impeller 9, the displacement mode of a rotator 4 also bends in the direction of A as the force commits the displacement mode of a rotator 4 in the direction of A and the amount of residual imbalance of a radial impeller 9 increases. Moreover, conversely, the force it is going to be straight weak like the displacement mode 31 which the displacement mode of the rotator 4 in case there is residual imbalance in the direction of C of a radial impeller 9 was controlled, and was

shown as the continuous line works, and the deflection of a commutator 18 also becomes small.

[0020] Drawing 7 means how the amount of deflections of the commutator 18 when the rotator 4 is rotating changes according to the phase contrast of the imbalance location which remains to the iron core 19 of a rotator 4, and the imbalance location which remains to the radial impeller 9. If it is target [for phase contrast to be **10 degrees] within the limits, the amount of deflections of a commutator 18 will be stopped by 6 micrometers or less, and will turn into the amount of deflections of less than 10 micrometers in **30-degree tolerance.

[0021] Drawing 8 shows the imbalance location gap of an imbalance location and a radial impeller 9 which remains to the iron core 19 of a rotator 4. To the imbalance location of a rotator 4, if it is the level which is satisfactory as an amount of deflections of a commutator 18 if imbalance location gap of a radial impeller 9 is target within the limits of **10 degrees in angle of rotation, and it is among [tolerance] **30 degrees in angle of rotation, the amount of deflections of a commutator 18 can be controlled, and there is also little effect which it has on a carbon brush 12, and it can attain reinforcement of a carbon brush 12.

[0022] Drawing 9 shows the relation about the deflection of the commutator 18 currently fixed to the amount of residual imbalance and rotator 4 of a radial impeller 9, and if the imbalance location of a rotator 4 and the imbalance location of a radial impeller 9

become opposition mostly, as for the deflection of a commutator 18, the deflection of a commutator 18 will increase with the increment in the amount of imbalance of a radial impeller 9. Moreover, if the imbalance location of a rotator 4 and the imbalance location of a radial impeller 9 become an inphase mostly, the deflection of a commutator 18 will be controlled and will decrease.

[0023] As mentioned above, by making the imbalance location of a radial impeller 9 into the imbalance location of a rotator 4 mostly at an inphase, the deflection of a commutator 18 can be controlled and combination imbalance correction can be made. Moreover, although he is trying to balance rotator 4 self using a balancing ring 17 in this example, since imbalance is corrected by using the approach of this example, a balancing ring 17 becomes unnecessary. Consequently, the shaft orientations of an electric blower can be shortened and an electric blower can be miniaturized.

[0024]

[Effect of the Invention] According to this invention, the combination balance correction after electric-blower assembly can be easily made by making the imbalance location of an impeller and a rotator into an inphase mostly. Moreover, it is not necessary to also correct and manage the amount of imbalance of an impeller severely.

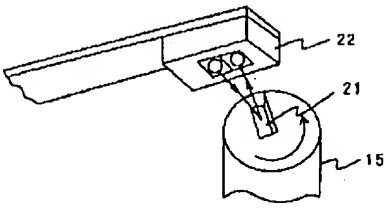
[0025] Moreover, since low vibration and low noise operation are attained, especially the balance precision of a commutator part can be improved also in high-speed rotation by combination balance correction, the rotation precision of a commutator is stabilized,

reinforcement of a carbon brush is attained, and the dependability of a motor can be raised more.

DRAWINGS

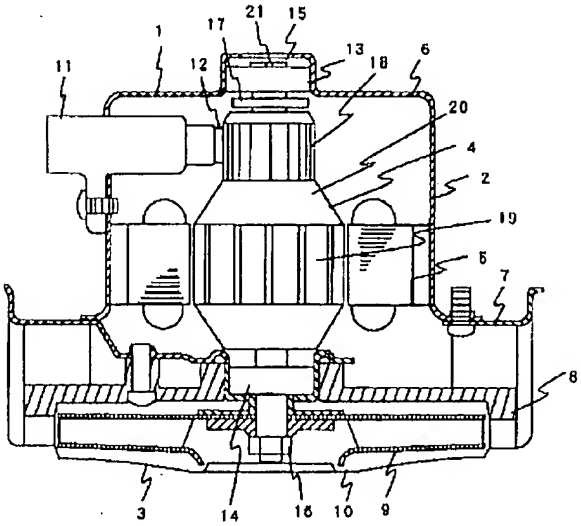
[Drawing 3]

図 3



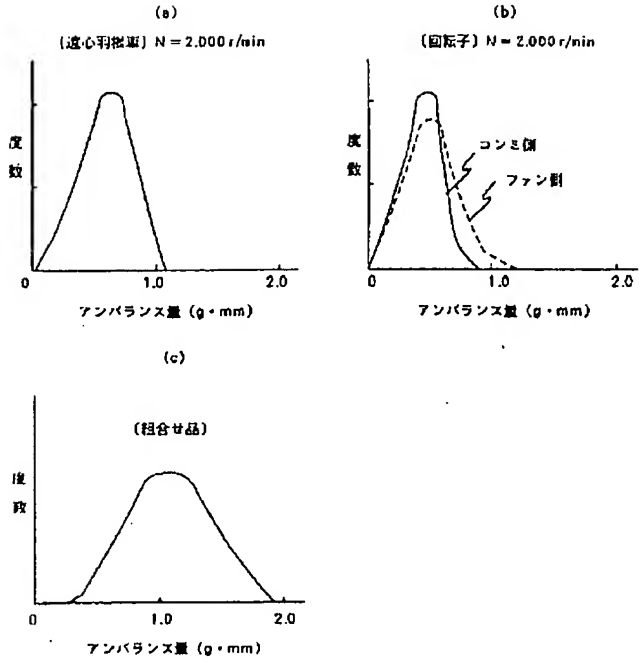
[Drawing 1]

図 1



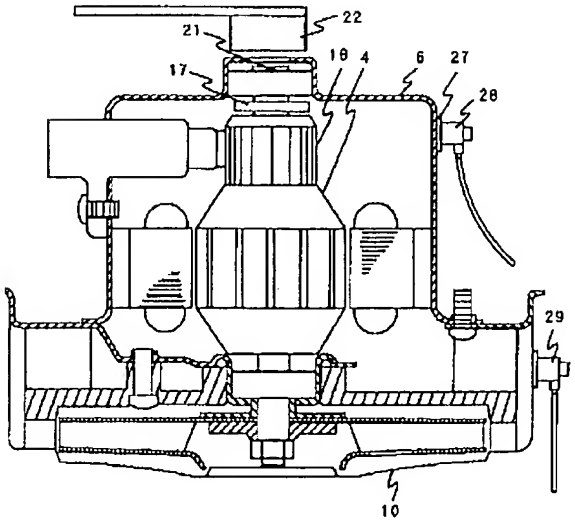
[Drawing 2]

図 2



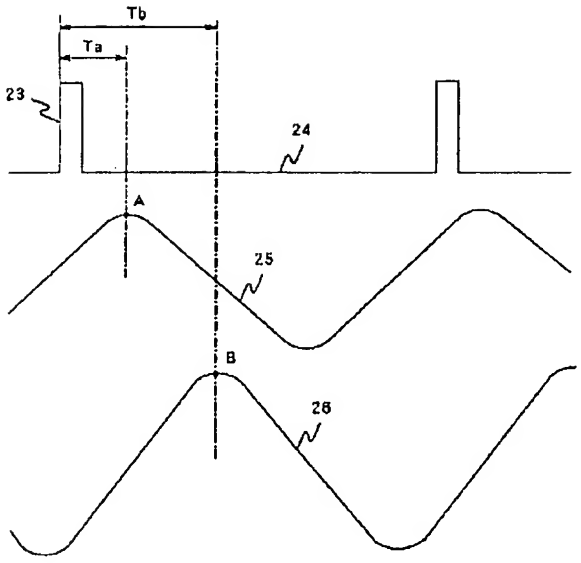
[Drawing 4]

図 4



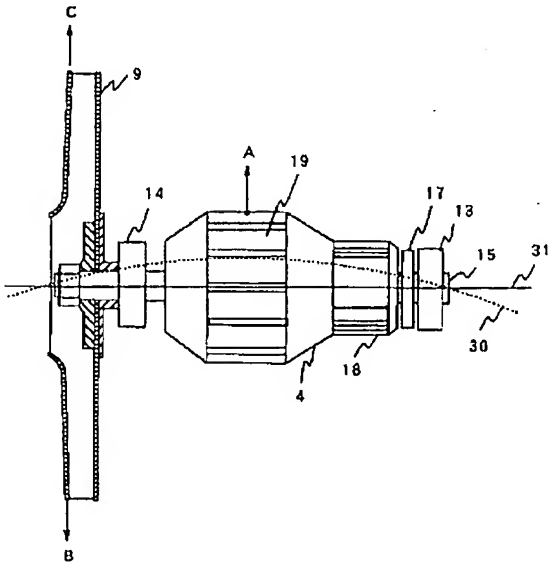
[Drawing 5]

図 5



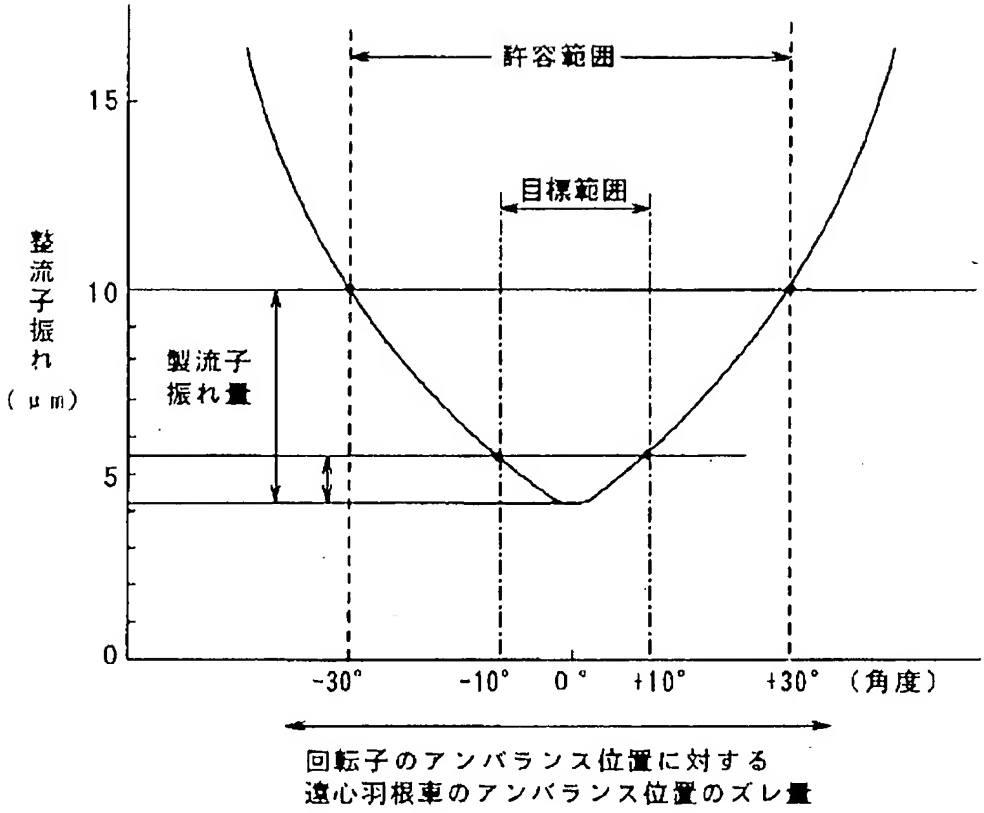
[Drawing 6]

図 6



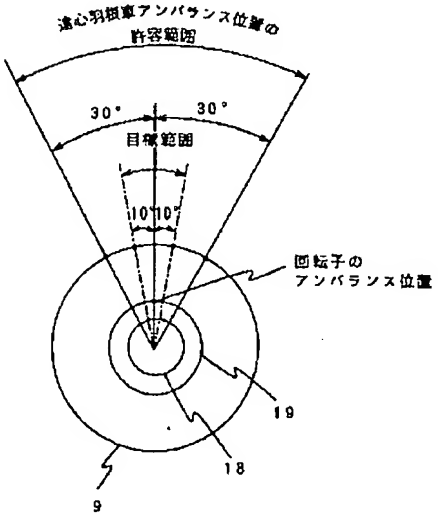
[Drawing 7]

図 7



[Drawing 8]

図 8



[Drawing 9]

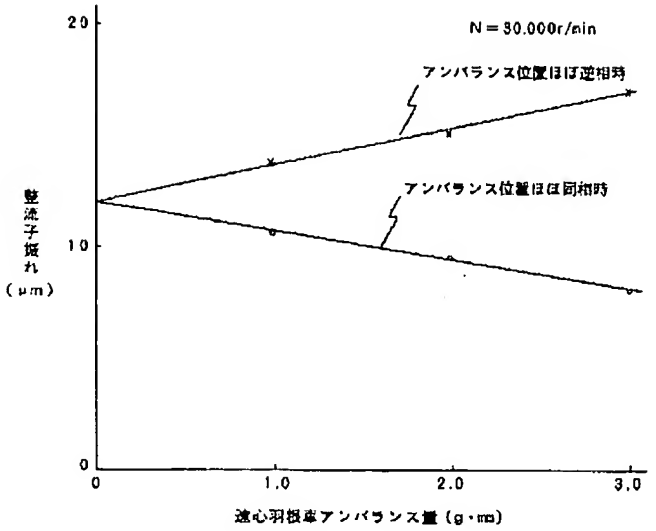


図6

CLAIMS

[Claim(s)]

[Claim 1] In the balance correction approach of an electric blower of detecting the imbalance location of the rotator attached and fixed to the revolving shaft of the commutator motor which it had in the electric blower, and an impeller, and making balance correction So that said rotator and said impeller may be combined, the imbalance location of said rotator and an impeller may be detected respectively and the phase of the imbalance location of said rotator and the imbalance location of said impeller may turn into an inphase mostly The balance correction approach of the electric blower characterized by making imbalance correction of said impeller.

[Claim 2] It is the balance correction approach of the electric blower characterized by rotating to said revolving shaft and imbalance correction of said impeller performing said impeller in claim 1.

[Claim 3] It is the balance correction approach of the electric blower characterized by making imbalance correction of said impeller by cutting said some of impellers in claim 1.

[Claim 4] It is the balance correction approach of the electric blower characterized by making imbalance correction of said impeller by adding a load to said some of impellers in claim 1.

[Claim 5] The balance correction approach of an electric blower that the imbalance location of said impeller is characterized by the less than **30-degree thing for which imbalance correction is made so that it may come in the phase contrast of an inphase mostly with angle of rotation to the imbalance location of said rotator in claim 1 thru/or claim 4.

[Claim 6] The engineering sensor installed in the location corresponding to the criteria location for balance measurement established in said a part of body of revolution in the balance measuring device of body of revolution, A detection means to detect the reflected light which is made to rotate said body of revolution while making said engineering sensor irradiate said criteria location, and is reflected by exposure, The balance measuring device of the body of revolution characterized by having an oscillating detection means to detect vibration of said body of revolution based on the detection value of said detection means, and an operation means to calculate the imbalance location of said body of revolution based on this detected vibration.

[Claim 7] It is the balance measuring device of the body of revolution characterized by being the rotator and impeller which attached said body of revolution in the revolving shaft of the commutator motor which it had in the electric blower in claim 6, and were fixed.